CLAIMS

We claim:

1. A hydrogenolysis method comprising:

reacting a composition with hydrogen, at a temperature of at least 120 °C, and in the presence of a solid catalyst;

wherein the composition comprises a component selected from the group consisting of: a 5 carbon sugar, a 5 carbon sugar alcohol, and lactic acid; and

wherein the solid catalyst comprises a rhenium-containing multimetallic catalyst.

2. The method of claim 1 wherein the carbon molar selectivity to PG is 25 to 40%.

3. The method of claim 1 wherein the method comprises a continuous conversion of a 5-carbon sugar alcohol and the solid catalyst comprises rhenium and nickel.

4. The method of claim 3 wherein the PG selectivity is at least 30%.

5. A composition of matter comprising:

a solid rhenium-containing multimetallic catalyst;

water, hydrogen; and

a 5 carbon sugar or a 5 carbon sugar alcohol.

6. The composition of claim 5 wherein the solid catalyst comprises nickel and a carbon support.

7. The composition of claim 6 wherein the water has a basic pH.

8. The composition of claim 6 wherein the catalyst contains 0.1 to 5 weight % rhenium and 1 to 10 weight % nickel.

9. The composition of claim 5 comprising 20 to 50 weight % of said 5-carbon sugar or sugar alcohol; and wherein the catalyst comprises nickel.

10. A method of making propylene glycol, comprising:

reacting a composition comprising lactate or lactic acid with hydrogen in the presence of a catalyst;

wherein acid is added to the composition prior to the step of reacting;

wherein the lactate or lactic acid is converted with a yield of at least 60%; and

wherein the PG selectivity is at least 80%.

11. The method of claim 10 wherein the step of reacting lactate or lactic acid comprises reacting with hydrogen at a pressure of at least 2300 psi (15.6 MPa).

wherein the carbon molar selectivity to PG is at least 30%.

12. A method of improving the reaction of hydrogen with a composition, comprising:

exposing the composition to hydrogen in the presence of a solid, rhenium-containing multimetallic catalyst;

wherein the composition comprises a component selected from the group consisting of: a 5 carbon sugar, a 5 carbon sugar alcohol, lactate and lactic acid; and

converting at least 80% of said component to lower molecular weight products including propylene glycol (PG);

wherein improving means that at the same conditions where the rhenium-containing multimetallic catalyst results in said at least 80% conversion, the yield of PG is improved by at least 5%, as compared with running the same reaction over each of: the same catalyst without rhenium, the same catalyst without rhenium but containing added weight of metal equal to the weight of rhenium in the improved method, and the same catalyst without rhenium but containing added moles of metal equal to the moles of rhenium in the improved method.

13. The method of claim 12 wherein the catalyst comprises nickel and the conversion of the component is continuous.

14. The method of claim 13 wherein the catalyst comprises a carbon support.

15. The method of claim 14 wherein the component comprises xylitol.

16. The method of claim 13 wherein the component comprises a 5 carbon sugar.

17. The method of claim 1 wherein the temperature is in the range of 170 to 220 °C and a pH of 8 to 13.

18. The method of claim 17 wherein the component comprises a 5 carbon sugar or 5 carbon sugar alcohol in aqueous solution.

19. The method of claim 18 wherein selectivity to the sum of PG, EG and glycerol is at least 75%.